

117 Cautionary Signals have been displayed at the 43 Signal Stations on the Lakes and Atlantic coasts, of which 65 were reported well justified by the succeeding high winds, while 48 were partially justified, and 4 were too late; 49 occasions were noted on which brisk winds were not signaled, in the most of which cases, however, the winds did not come from dangerous points of the compass.

NAVIGATION.

Ice.—Ice moved out of the harbor of Escanaba on the 4th. In the eastern portion of Lake Ontario ice continued to impede navigation until the 14th. Sabago Lake, in Maine, was opened to navigation on the 4th. The navigation of the larger Lakes was continued throughout the month. Lake Champlain was generally open on the 30th of April, being the latest date for 60 years—it had been closed for 104 days—the longest period, with one exception, during this century.

The extreme depth of water in the Mississippi and its tributaries is shown by the table on chart No. III, whence it appears that at all river stations the water was, in the last week of the month, from 3 to 30 feet lower than during the first week.

TEMPERATURE OF THE WATER.

The temperature of the water has varied between 29° and 40° at Eastport, Maine, but between the extremes, 74° and 87° at Key West, Florida, the change being quite gradual as we proceed southward along the Atlantic coast. The range of temperature has increased from 5° in Maine to 13° along the South and Middle Atlantic coasts, but to 18°, 20° and 30° in the rivers and lakes in the interior of the country. The details, for all stations, are given in the table on Chart No. II.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—Displays of thunder and lightning have been least frequent in the Middle Atlantic States, where they have occurred on the 7th, 12th, 15th, 16th, 19th and 23d, and in southern New England, where they have occurred on the 1st, 2d, 8th, 9th, 12th, 15th, 19th, 20th, 24th, 29th and 30th. They have been most frequent in the Eastern Gulf States, Tennessee and the Ohio valley, the upper Mississippi and lower Missouri valleys, where they have occurred on from 16 to 20 days during the month.

Auroras.—The auroras most extensively visible were those of the 4th, in Connecticut, Maine, New York, Michigan, Wisconsin, Minnesota; on the 22d, in Connecticut, Maine, New Hampshire, Vermont, Massachusetts, New York, Ohio, Michigan, Wisconsin and Minnesota. Less extensive displays, were reported from two or more stations, on the 2d, 3d, 5th, 7th, 9th, 10th, 11th, 12th, 13th, 15th, 16th, 18th, 23d, 24th, 26th, 27th, 29th, 30th and 31st.

OPTICAL PHENOMENA.

(1) *Solar Halos* were observed at some stations on every day of the month but the 23d. The following is a list of those observed in two or more different States: 1st, Maine, Massachusetts, New Hampshire, New York, Connecticut, Georgia, and New Jersey; 2d, Iowa and Georgia; 3d, Illinois, Maine, Missouri, New York, North

Carolina, Ohio, Virginia, Wisconsin, Michigan, Georgia, Nebraska and Minnesota; 4th, Dakota, Iowa, Kansas, Missouri, Nebraska, New Hampshire, New York, Michigan and Minnesota; 5th, Alabama, Kansas, Nebraska, New Hampshire, New York, North Carolina, Ohio, Virginia, West Virginia and Louisiana; 6th, Iowa, Maine, New Hampshire, Ohio and Wisconsin; 7th, Iowa, Nebraska, New York, Ohio, Louisiana and Wisconsin; 8th, Virginia, Louisiana, Maine and Mississippi; 9th, Iowa and Wisconsin; 10th, Kansas, Virginia and Wisconsin; 11th, Canada, Indiana, Mississippi, New York, Ohio and Georgia; 12th, Alabama, Dakota, Delaware, Iowa, Massachusetts, Mississippi, Nebraska, New York, Wisconsin, New Jersey, Connecticut, Louisiana and Michigan; 13th, Indiana, Mississippi, Ohio, New Jersey, Connecticut, Michigan, Georgia and Florida; 14th, California, Illinois, Indiana, Iowa, Maine and Ohio; 15th, Iowa, Missouri, Tennessee and Wisconsin; 16th, Alabama, Illinois, Indiana, Tennessee, Wisconsin and Georgia; 17th, Iowa, Michigan, Missouri, New York, Ohio, Wisconsin and Louisiana; 18th, California, Iowa, Kansas, Maine, New Mexico and Ohio; 19th, Nebraska, Alabama, Colorado, Dakota, New York, Ohio, Wisconsin, Georgia, Maine and Illinois; 20th, California, Mississippi, New Hampshire and New York; 22d, New York and Maine; 24th, Maryland, Massachusetts, New York and New Jersey; 25th, Alabama and Illinois; 26th, Mississippi and New York; 27th, Indiana and Kentucky; 29th, Mississippi, Nevada, New Hampshire, Massachusetts and Louisiana; 30th, Canada, Iowa, New York, Ohio, Wisconsin, Louisiana and Michigan; 31st, Illinois, Indiana, Ohio, Virginia, Louisiana and Wisconsin.

(2) *Lunar Halos*.—The principal Lunar Halos were observed as follows: on the 8th, Colorado, Kentucky, Ohio, Tennessee, Virginia; 9th, Georgia, Maryland, Ohio, Pennsylvania, Virginia, Wisconsin, Massachusetts and Iowa; 10th, New Hampshire, Wisconsin and Florida; 11th, Massachusetts, New Jersey, New York, Texas, Connecticut, Wisconsin and Indian Territory; 12th, Alabama, Illinois, Iowa, Kansas, Louisiana, Mississippi, Wisconsin, Florida, Minnesota and Indian Territory; 13th, Georgia, Kentucky, Maryland, Massachusetts, New Jersey, New York, Ohio, Pennsylvania, Texas, Utah, Virginia, West Virginia, Louisiana, Colorado and Indian Territory; 14th, Iowa, New York, Texas, Massachusetts, North Carolina, Florida and Indian Territory; 15th, Kentucky, Louisiana, Mississippi, Tennessee, Virginia, Texas, Illinois, and Florida; 16th, Kansas, Maine, Massachusetts, North Carolina, Texas, Florida and Georgia; 17th, Alabama, Iowa, Michigan, Minnesota, New York, Ohio, South Carolina, Colorado, Kansas and Indian Territory; 18th, Nebraska, Texas, South Carolina, Georgia, Utah, Iowa, Tennessee and Indian Territory; 19th, Canada, Ohio, Virginia, Massachusetts, Michigan and Georgia; 20th, Indiana, Maine, Massachusetts, New York, Utah, and Florida; 21st, Utah and Georgia.

(3) *Mirage*.—The phenomena of Mirage was observed on the 9th at Alpena; 10th in Iowa and Kansas; 14th in Kansas; 17th, Milwaukee; 25th, Kansas.

MISCELLANEOUS PHENOMENA.

(1) *Natural History*.—The following items relating to natural history have been reported—

Grasshoppers were reported in Kansas throughout the month, and in Nebraska thick during the latter part of the month, especially from the 22d to the 26th, during which time they were moving north and north-westward. They were especially reported on the 23d at Cheyenne and on the 21st at Denver.

Locusts.—Kansas, 8th to 12th and 25th.

The Colorado Potato Bug was reported from Delaware, Indiana, New Jersey, West Virginia and Ohio.